DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY ARMOR CENTER AND FORT KNOX
FORT KNOX, KENTUCKY 40121-5000

REPLY TO
ATTENTION OF:
ATZK-MS (40)

7 April 2006

MEMORANDUM FOR

Commanders, All Units Reporting Directly to This Headquarters
Commanders, Fort Knox Partners in Excellence
Directors and Chiefs, Staff Office/Departments, This Headquarters

SUBJECT: Prevention of Heat Injuries

1. References:

a. AR 40-5, 22 July 2005, Preventive Medicine.

b. TRADOC Reg. 350-29, 16 July 2003, Prevention of Heat and Cold Casualties.

c. TB MED 507, 7 March 2003, Heat Stress Control and Heat Casualty Management.

d. FM 4-25.12, 25 January 2002, Unit Field Sanitation Team.

e. Commander's, Senior NCO's and Instructor's Guide to Risk Management of Heat Casualties (Prepared by the U.S. Army Center for Health Promotion and Preventive Medicine).

f. Initial Military Training (IMT) Heat Injury Prevention 2006 Memorandum, 7 March 2006 (Prepared by the TRADOC Surgeon's Office, U.S. Army Accessions Command).

2. A comprehensive hot weather injury prevention and management program should follow the principles of risk management by identifying hazards, assessing the hazards in terms of severity and probability, and implementing appropriate controls to abate the hazards. Spot-checking and supervision by first-line leaders should be employed to ensure control measures are being implemented. Units train using risk management principles; therefore commanders and leaders should apply the same framework to prevent hot weather injuries.

3. The purpose of this memorandum is to provide information to commanders and supervisors at all levels regarding prevention of heat injuries during the hot weather season. Successful heat injury prevention is a command responsibility and depends on establishing an effective heat injury prevention program.

4. Everyone has a role in the prevention of heat injuries. The major responsibilities, however, are those of the unit commanders and Preventive Medicine.

a. Unit commanders and leaders will:

(1) Use the *Commander's, Senior NCO's and Instructor's Guide to Risk Management of Heat Casualties* guidance included as Enclosure.

(2) Modify training/physical activity and uniform wear for heat conditions.

(3) Monitor the Wet Bulb Globe Temperature Thermometer (WBGT) at each training site.

(4) Follow the work/rest/hydration strategy for each heat category.

(5) Use a hydration monitoring system such as Odgen Cords, Riley water card, or drinking water schedules.

(6) Ensure pre-planning of medical support with immediate cooling capability for all training events (iced sheets).

(7) Incorporate training site treatment and evacuation rehearsals/battle drills to reinforce effective responses to heat injury events from the point of injury until the Soldier arrives at the supporting medical treatment facility.

(8) Ensure that the decision making authority for modifying training events based upon projected heat category is powered down to the lowest appropriate level.

(9) Assess training/mission hazards from warm weather.

(a) During the advance planning stages, incorporate information about the mean and extreme climatic conditions at the deployment site, to include the 24-hour pattern of temperature and humidity and the times of sunrise and sunset.

(b) Obtain regular real-time, local weather data and predictions to identify windows of opportunity for critical military operations. Commanders may obtain the necessary weather information by contacting OL-C 18th Weather, Weather Squadron (USAF) at 624-5653 or via the Fort Knox website.

(10) Conduct formal training to all personnel in the prevention, recognition, and prompt treatment of heat injuries before the start of the heat season. Leaders should be trained by using the TRADOC Heat Injury Prevention Presentation sent out by TRADOC and available by contacting Preventive Medicine at 624-0508/7. Initial entry training soldiers should be trained in heat injury prevention at the start of each hot season cycle.

b. USAMEDDAC Preventive Medicine will:

(1) Interview soldiers diagnosed as having signs and symptoms of heat injury to determine predisposing conditions and the circumstances surrounding the development.

(2) Use the Tri-service Reportable Medical Events System to report heat casualties.

(3) Communicate to field commanders immediately upon recognition of heat injury sentinel events and clusters.

(4) Conduct heat injury prevention training upon request. Commanders may obtain additional information on the prevention of heat injuries as well as schedule heat injury prevention classes by contacting MEDDAC Preventive Medicine at 624-0502/7.

FOR THE COMMANDER:

Encl

STEVEN E. BRAVERMAN
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Commander's, Senior NCO's and Instructor's Guide to Risk Management of Heat Casualties

Risk Management is the process of identifying and controlling hazards to protect the force.

Possible Outcomes of inadequate climatic heat management:

Casualty	Risk Severity
Heat Cramps	Marginal
Heat Exhaustion	Critical
Heat Stroke	Critical-Catastrophic
Water Intoxication (Over Hydration)	Critical-Catastrophic

The Five Steps of Risk Management are:

1 Identify Hazards

High heat category, especially on several sequential days (Measure WBGT when ambient temperature is over 75º F)

Exertional level of training, especially on several sequential days

Acclimatization (and other individual risk factors – see table below)

Temperature at night / rest overnight

Individual Risks for Heat Casualties (The more factors, the higher the risk)

- **Not acclimatized** to heat (need 10-14 days to get trainees adequately acclimated)
- Exposure to cumulative days (2-3 days) of any of the following
  - Increased heat exposure
  - Increased exertional levels.
  - Lack of quality sleep
- Poor fitness (Unable to run 2 miles in < 16 minutes)
- Overweight
- Minor illness (cold symptoms, sore throat, low grade fever, nausea, vomiting)
- Taking medications (either prescribed or over the counter)/ supplements/ dietary aids Ex: Allergy or cold remedies. Ephedra supplement
- Use of Alcohol in the last 24 hours
- Prior history of heat illness (any heat stroke, or >2 episodes of heat exhaustion)
- Skin disorders such as heat rash and sun burn which prevent effective sweating
- Age > 40 years

2 Assess Hazards

- When ambient temperature is over 75° F, constantly assess the **heat category** using Wet Bulb Globe Temperature (WBGT)
- Know your soldiers! Identify early who will be at increased risk based on **individual risk factors**.
- Check **hydration status** at the end of each training day. Give extra fluid at night and in the morning if hydration is inadequate.
  - Review Riley (water) card or Ogden cords
  - Ask about urine color. Urine is clear if well hydrated
- Daily **assess the overall risk** for developing a heat casualty (may use a risk matrix).

Example of a Heat Injury Risk Management Matrix

Scores assigned to different conditions based on risk for developing a heat injury.
This scoring system: 0= Low risk; 1=Medium risk, 2=High risk; 3=Extreme risk

RISK FACTORS	**Level of Risk** (For each Factor Circle the Appropriate Condition)			
	0	**1**	**2**	**3**
Risk Management Worksheet	All control measures implemented			Not all control measures implemented
Heat (WBGT at site)	Category 1 or less	Category 2 and 3	Category 4	Category 5
No. Sequential Days Heat Cat 5	0	1	2-3	≥4
Any Heat Injuries in the Past Two Days	None	Heat Cramps	Heat Exhaustion	Heat Stroke
Work in Past Two Days (see below)	Easy	Easy or Moderate	Moderate or Hard	Hard
Projected Work for the Present	Easy	Easy or Moderate	Moderate or Hard	Hard
Heat Acclimatization Days	>13	7-13	3-6	<3
Leader/Cadre Presence	Full Time	Substantial	Minimal	None
Level of Training of Cadre	18 Months	7-18 Months	1-6 Month	< 1 Month
Communication System	Radio and Phone	Phone Only	Radio Only	None
Rest in Previous 24 Hours	> 7 Hours	5-7 Hours	2-4 Hours	< 2 Hours

A cumulative score of 25-33 means extreme risk, 16-24 means high risk, 7-15 means medium risk, and 0-7 means low risk.

Easy Work	Moderate Work	Hard Work
• Weapon Maintenance • Walking Hard Surface at 2.5 mph, < 30 lb Load • Marksmanship Training • Drill and Ceremony	• Walking Loose Sand at 2.5 mph, no Load • Walking Hard Surface at 3.5 mph, < 40lb Load • Calisthenics • Patrolling • Individual Movement Techniques. i.e. low crawl, high crawl	• Walking Hard Surface at 3.5 mph, ≥ 40 lb Load • Walking Loose Sand at 2.5 mph with Load • Field Assaults

3 Develop Controls

Education

- Establish SOPs. Ensure all personnel are trained and follow SOPs for Heat Casualty Prevention.
- Ensure all bulletin boards have Heat Casualty Prevention posters and all leaders have Heat Casualty Prevention aids.

Planning

- Adjust the training schedule to minimize consecutive days of heavy physical training, especially if other heat stressors exist (eg. heat exposure and lack of quality sleep)
- Plan communications, medical and evacuation support.
- Plan and provide adequate hydration for *all* personnel (including Cadre and Drill Instructors).
- When planning training events, keep in mind:
  - Time of day the training is conducted – morning is cooler
  - Location of training
    - Sun vs. shade
    - Open vs. protection from wind - wind has cooling effect
  3. Clothing
    - Heavy, restrictive vs. loose, lightweight
  4. Where in training cycle
    - Most Heat Casualties occur in the 2nd or 3rd week of Recruit training.
    - Acclimatization can take 7-14 days, depending on the physical condition of the trainee.

Identification

- Identify previous heat exhaustion or heat stroke soldiers and mark visibly on uniform (tape or cord).
- Identify overweight soldiers and soldiers who are unfit.
- Identify soldiers on medications and mark visibly on uniform (tape or cord).
- Seriously consider taking soldiers out of training who have had alcohol within the last 24h. Seriously consider having ill soldiers seen on sick call.
- Note and document heat category hourly. Position WBGT at site of training.

Develop a Hydration Monitoring System

- Examples of monitoring methods:

- Riley (water) card

WATER CONSUMPTION TABLE

Heat Category	Easy Work	Moderate Work	Hard Work
	Amount to Drink Qt/Hr (one canteen = 1QT)		
1	½	¾	¾
2	½	¾	1
3	¾	¾	1
4	¾	¾	1
5	1	1	1

Do not drink more than 1½ qts per hour or 12 qts per day.
Eat meals! Important for sodium and other electrolytes.

Name:

Time	Mon	Tue	Wed	Thur	Fri	Sat	Sun
0500-0600							
0600-0700							
0700-0800							
0900-1000							
1000-1100							
1100-1200							
1200-1300							
1300-1400							
1400-1500							
1500-1600							
1600-1700							
1700-1800							
1800-1900							
1900-2000							
2000-2100							
2100-2200							

On the back of card: (Battle buddy is to write the amount of water the soldier has drunk).

- Ogden Cord is 550 cord, parachute cord or shoestring that is tied to a uniform buttonhole or ear protection case. Soldiers tie a knot in the cord each time they finish a canteen (1 quart) of water.

3 Develop Controls continued

Know Standardized Guidelines for Warm Weather Training Conditions

Fluid Replacement and Work/Rest Guide

Acclimatized (after approx two weeks training) Wearing BDU, Hot Weather

		Easy Work		Moderate Work		Hard Work	
Heat Category	**WBGT Index, (F°)**	**Work/ Rest**	**Water Intake (Qt/h)**	**Work/ Rest**	**Water Intake (Qt/h)**	**Work/ Rest**	**Water Intake (Qt/h)**
1	78-81.9	NL	½	NL	¾	40/20 min	¾
2 (Green)	82-84.9	NL	½	50/10 min	¾	30/30 min	1
3 (Yellow)	85-87.9	NL	¾	40/20 min	¾	30/30 min	1
4 (Red)	88-89.9	NL	¾	30/30 min	¾	20/40 min	1
5 (Black)	> 90	50/10 min	1	20/40 min	1	10/50 min	1

- The work-rest times and fluid replacement volumes will sustain performance and hydration for at least 4 h of work in the specified heat category. Fluid needs can vary based on individual differences (± ¼ qt/h) and exposure to full sun or full shade (±¼ qt/h).
- NL= no limit to work time per hour.
- Rest means minimal physical activity (sitting or standing), accomplished in shade if possible.
- **CAUTION:** Hourly fluid intake should not exceed 1½ quarts.
- Daily fluid intake **should not exceed 12 quarts.**
- If wearing body armor add **5°F** to WBGT in humid climates
- If wearing NBC clothing (MOPP 4) add **10°F** to WBGT.

Easy Work = Walking hard surface 2.5 mph <30# load, Weapon maintenance, Marksmanship training
Moderate Work = Patrolling, Walking sand 2.5 mph no load, Calisthenics
Hard Work = Walking sand 2.5 mph w/load, Field assaults

Continuous Work Duration and Fluid Replacement Guide

Acclimatized (after approx two weeks training) Wearing BDU, Hot Weather

It is assumed the trainees performing these continuous effort tasks have not had heat stress or dehydration prior to this activity and will have extended rest afterwards!

		Easy Work		Moderate Work		Hard Work	
Heat Category	**WBGT Index, (F°)**	**Work (min)**	**Water Intake (Qt/h)**	**Work (min)**	**Water Intake (Qt/h)**	**Work (min)**	**Water Intake (Qt/h)**
1	78-81.9	NL	½	NL	¾	70	1
2 (Green)	82-84.9	NL	½	150	1	65	1 ¼
3 (Yellow)	85-87.9	NL	¾	100	1	55	1 ¼
4 (Red)	88-89.9	NL	¾	80	1 ¼	50	1 ¼
5 (Black)	> 90	180	1	70	1 ½	45	1 ½

- NL can sustain work for at least 4 hours in the specified heat category
- Fluid needs can vary based on individual differences (± ¼ qt/hr) and exposure to full sun or full shade (± ¼ qt/hr).

4 Implement Controls

Decision to accept risk is made at the appropriate level

- Local SOP may dictate at what level the risk must be evaluated by a higher commander.

Identified controls are in place

- Update WBGT hourly.
- Adhere to work/rest cycle in high heat categories. Rest in shade.
- Space out soldiers in formations during runs. (This is very effective to allow individual heat dissipation during runs.)
- For tasks requiring continuous effort, adhere to guideline and allow extended rest afterwards.
- Training event incorporates good prior planning.

Monitor and enforce hydration standard

- Encourage frequent drinking, but not to exceed **1 ½** quarts per hour or **12** quarts per day. Make water more palatable, if possible, by cooling.
- Do not allow soldiers or trainees to empty canteens to lighten load (consider imposing a penalty in timed events).
- Ensure soldiers are well hydrated before training. Ask about urine; urine is clear if well hydrated.
- Check Riley (water) card or Ogden Cord frequently.

Monitor and enforce eating of meals

- Ensure all meals are eaten during the meal break
- Ensure adequate time to eat and drink meals
- Table salt may be added to food when the heat category is high. Salt tablets are *not* recommended

Execute random checks

- Spot checks by Cadre, Senior NCO's, and Drill Instructors
- Enforce battle buddy checks – need to be aware of each other's eating, drinking and frequency of urination
- Plan placement of leaders to observe and react to heat casualties in dispersed training

Follow clothing recommendations:

- Heat category 1-2: no restrictions
- Heat category 3: Unblouse trouser legs, unbuckle web belt
- Heat category 4-5:
  - Unblouse trouser legs, unbuckle web belt
  - Remove t-shirt from under BDU top or remove BDU top down to T-shirt (depends whether biting insects are present)
  - Helmets worn when needed for safety reasons
- MOPP 4: 10°F to WBGT.

Have soldiers take cold showers after moderate and heavy work with category 3 and above at the end of the day. (This will minimize cumulative thermal load.)

5 Supervise & Evaluate

- Enforce SOPs
- Delegate responsibilities to ensure control measures have been implemented
- Monitor adequacy/progress of implementation of control measures
- Conduct spot checks of cadre. Do cadre have current WBGT? Are cadre implementing work/rest/drink cycles? Make on-the-spot corrections. Lead by example.
- Conduct spot checks of recruits. Ask recruits questions while observing their mental status and physical capabilities. Look out for common signs and symptoms which can rapidly progress to serious signs and symptoms.
- If 1-2 recruits become heat casualties, stop all training and evaluate each soldier for early signs and symptoms of becoming an impending heat casualty.
- When controls fail, heat injuries occur. The ability to recognize heat injury is paramount. Take immediate action if any heat injuries are observed or suspected. Stop-rest-cool then evaluate in accordance with warning signs and symptoms. If in doubt, evacuate.

Warning Signs and Symptoms of Heat Casualty and Water Intoxication

Indications of possible Heat Casualty

More Common Signs / Symptoms	Immediate Actions
• Dizziness • Headache • Nausea • Unsteady walk • Weakness • Muscle cramps	• Remove from training • Allow casualty to rest in shade • Take sips of water • While doing the above, call for Medic evaluation of the soldier (Medic will monitor temperature and check for mental confusion) **If no medic is available call for ambulance or MEDEVAC. Ensure same Trainer keeps monitoring the casualty.**
Serious Signs / Symptoms	**Immediately call MEDEVAC or ambulance for emergency transport while doing the following:**
• Hot body, high temperature • Confusion (Mental Status Assessment) • Vomiting • Involuntary bowel movement • Convulsions • Weak or rapid pulse • Unresponsiveness, coma • Hyperventilating	• Lay person down in shade with feet elevated until MEDEVAC or ambulance arrives • Undress as much as possible • Pour cool water over person and fan • Give *sips* of water while awaiting ambulance (if conscious) • Monitor airway and breathing until ambulance or MEDEVAC arrive • Continue cooling during transport or until body reaches 100F or shivering occurs.

5 Supervise & Evaluate continued

Indications of possible Water Intoxication (Over Hydration)	
Signs and Symptoms Confusion *Weakness* Vomiting	**What to do:** **Ask these questions to the soldier or battle buddy:** • Has soldier been eating? Check rucksack for # of MRE's left. (suspect water intoxication if soldier had not been eating) • Has soldier been drinking a lot? (suspect water intoxication if soldier has been drinking constantly). • How often has soldier urinated? (frequent urination seen with water intoxication; infrequent urination with heat illness) • What color is urine (clear urine may indicate over hydration) If soldier has been drinking and urinating a lot, yet has these symptoms, **immediately call MEDEVAC or ambulance for emergency transport**

Mental Status Assessment

An important sign that the soldier is in a serious life-threatening condition is the presence of mental confusion (with or without increased temperature). Anyone can do a mental status assessment asking some simple questions.

Call for emergency MEDEVAC or ambulance if *any* of the following exist:

What is your name?
(Does not know their name.)
What month is it? What year is it?
(Does not know the month or year.)
Where are we/you?
(Does not know the place where they are at.)
What were you doing before you became ill?
(Does not know the events that led to the present situation.)

Hot Weather Casualties and Injuries Chart

- Train commanders and soldiers on heat injury prevention and heat risk assessment
- Remember the acronym **H-E-A-T** when training in hot weather
  (**H**: heat category; **E**: exertion level; **A**: acclimatization; **T**: time of heat exposure and recovery time)
- Follow recommended fluid replacement guidelines and ensure nutritional requirements are met

Hot Weather Injuries and Casualties

Cause	Symptoms	First-Aid	Prevention
Sunburn			
• Exposure of skin to direct sun • Can occur on overcast days	• Red, hot skin • May blister • Moderate to severe pain • Can result in fever	• Move to shade; loosen clothing if necessary • Apply cold compress or immerse in cool water • Apply moisturizing lotion to affected areas • Hydrate with fluids • Administer analgesics for pain or fever • Do not break blisters	• Adequate sun protection • Use sunscreen liberally and apply often, especially when sweating excessively • Select SPF 15 or higher • Proper wear of clothing, cap
Heat Rash (Prickly Heat)			
• Restrictive clothing • Excessive sweating • Inadequate hygiene • Causes heat intolerance if 20% of skin affected	• Red, itchy skin • Bumpy skin due to blocked pores • Moderate to severe itching • Can result in infection	• Apply cold compress or immerse in cool water • Keep area affected dry • Control itching and infection with prescribed medications	• Proper wear of clothing • Shower (nude) after excessive sweating
Heat Cramps			
• Excessive loss of salt from body due to excessive sweating • Not acclimatized to hot weather	• Painful skeletal muscle cramps or spasms • Mostly affects legs and arms	• Replace salts • Sit quietly in the shade or cool area • Massage affected muscle • Drink oral rehydration package or sports drink • Drink 0.05 to 0.1% salt solution (add ¼ of MRE salt packet to 1 quart canteen) • Get medical evaluation if cramps persist	• Eat all meals to replace salt • Consume salt-supplemented beverages if adequate meals have not been consumed prior to prolonged periods of heavy sweating • Ensure adequate heat acclimatization
Heat Exhaustion			
• Body fatigue and strain on heart due to overwhelming heat stress • Dehydration (see below) • Inadequate acclimatization • Inadequate physical fitness for the work task • Most common exertional heat illness	• Dizziness • Fatigue • Weakness • Headache, nausea • Unsteady walk • Rapid pulse • Shortness of breath	• Initiate active cooling by best means available • Move to shade and loosen clothing • Lay flat and elevate feet • Spray/pour water on soldier and fan for cooling effect or use ice sheets around neck, arm pits and groin, if available • Monitor with the same (one) instructor or supervisor • Assess soldier's mental status every few minutes • Have soldier slowly drink one full canteen (quart) of cool water every 30 minutes with a maximum of 2 canteens • If not improved in 30 to 60 minutes, evacuate for further medical care • NOTE: Those who recover within 60 minutes should return to light duty on a profile for the remainder of the day	• Allow for acclimatization • Monitor WBGT • Keep soldiers in shade whenever possible • Follow water replacement guides • Observe work-rest cycles • Identify high risk individuals • Maintain buddy system • Eat all meals in garrison and field • Do not take dietary supplements • Modify uniform accordingly • Teach early recognition of symptoms • Recognize cumulative effect of sequential hot days • Reevaluate training mission if several mild heat injuries occur
Heat Stroke			
• Prolonged exposure to high temperatures • Cumulative heat stress due to repetitive activity in hot environment • Failure of body's cooling mechanisms • Prolonged and overwhelming heat stress • Predisposing factors such as sickness, poor health or certain medications	• Any of above symptoms, but more severe • Nausea, vomiting • Altered mental status with agitation, confusion, delirium, disorientation • Elevated temperature, usually above 104? F • Can progress to loss of consciousness, coma, and seizures	• This is a **medical emergency** and can lead to death! **Evacuate** soldier to a medical facility immediately! • **Begin cooling aggressively**. Body temperature that does not go below 100? F with active cooling or ANY mental status changes calls for immediate evacuation. • Initiate measures for heat exhaustion • Apply ice packs or iced sheets • Assess soldier's mental status every few minutes • If conscious, give sips of cool water while waiting for evacuation or ambulance • Do not give water to unconscious soldier • If possible, measure body temperature • Monitor airway and breathing • If medic or CLS is present, start intravenous (IV) fluids but limit to 500 ml NS or LR • Continue cooling process during transport (until body temperature reaches 100?F	• Follow measures for heat exhaustion • Plan medical support for heat-intensive operations • Ensure appropriate Evacuation capabilities available • Ensure Preventive Medicine personnel and measures are in place

Additional Medical Considerations in the Hot Weather Environment:

Dehydration			
• Depletion of body fluids and possibly salt	• Dizziness • Weakness and fatigue • Rapid pulse	• Replace lost water and salt • Water should be sipped, not gulped • Get medical treatment	• Drink 3-6 quarts of fluid per day • Follow fluid replacement guidelines • Consume full meals and drink at mealtime • Do not take dietary supplements
Over Hydration (Hyponatremia)			
• Over hydration or water intoxication • Decreased meals or dieting • Loss of body salt • Misdiagnosis and treatment for dehydration	• Confusion • Weakness • Nausea, vomiting	• Replace salt loss • Follow measures for heat exhaustion • If symptoms persist or become more severe with rehydration, immediate evacuation	• Follow fluid replacement guidelines • Replace lost salt by consuming meals and sports drinks, as directed • Provide snacks or carbohydrate electrolyte beverage during long training events • Do not take dietary supplements